

REMARKS

The present application was originally filed on April 20, 2000 with claims 1-28. Claims 1-28 remain pending in the application; claims 1, 9, 15 and 23 are the independent claims.

Claims 2, 12, 16 and 26 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

Claims 1, 2, 5-9, 12-16, 19-23 and 26-28 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,640,242 to O'Boyle et al. (hereinafter "O'Boyle") in view of U.S. Patent No. 6,186,877 to Lofaro (hereinafter "Lofaro").

Claims 3, 4, 10, 11, 17, 18, 24 and 25 are rejected under 35 U.S.C. §103(a) as being unpatentable over O'Boyle and Lofaro in view of U.S. Patent No. 5,667,424 to Pan (hereinafter "Pan").

In this response, claims 2, 12, 16 and 26 have been amended without prejudice merely to provide further clarity in view of the stated subjective preferences of the Examiner. Applicant respectfully traverses the §112 and §103 rejections and requests reconsideration of the present application in view of the above amendments and the remarks set forth below.

With regard to the §112 rejection of claims 2, 12, 16 and 26, the Examiner contends that "the language 'utilizing a high speed camera' in line 4 does not particularly point out and distinctly claim the invention because it is unclear what the metes and bounds of a 'high speed camera' is from Applicant's Specification." (Office Action; page 3, lines 1-3) Applicant respectfully disagrees with this contention.

As stated in the dissenting opinion in the Appeal Decision dated October 31, 2007:

I find the term "high speed" used in connection with imaging has a specific meaning to skilled artisans and is therefore amenable to construction and not "insolubly ambiguous" so as to render the claims indefinite. In my view, skilled artisans would understand that the limitation is a term of art referring to a particular type of imaging system *with elevated frame rates* – frame rates that substantially exceed those of standard, consumer-grade devices. (Decision on Appeal; page 10, lines 12-18; emphasis in original)

See also *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1366, 71 USPQ2d 1081, 1089 (Fed. Cir. 2004) ("The requirement to 'distinctly' claim means that the claim must have a meaning discernible to one of ordinary skill in the art when construed

according to correct principles... Only when a claim remains insolubly ambiguous without a discernible meaning after all reasonable attempts at construction must a court declare it indefinite.”).

It is clear from Applicant’s specification that the term “high speed camera” is recited in conjunction with an imaging device capable of acquiring high resolution images of the substrate while the substrate is rotating in situ at a high velocity, such as a few hundred lineal feet per minute. (See, *e.g.*, Specification; page 7, lines 17-19: “the substrate 14 is rotating at a high velocity which translates to speeds up to a few hundred linear [sic] feet per minute;” and page 10, lines 16-18: “The high speed camera 30 is thus able to acquire or capture high resolution images of areas or portions of the substrate 14 by virtue of its high speed nature.”) Since the Specification provides sufficient description such that the skilled artisans would understand the metes and bounds of the term “high speed camera” as used in an imaging context, Applicant asserts that such recitation of “high speed camera” in the subject claims is not indefinite within the meaning of §112, second paragraph.

Notwithstanding the above traversal, however, Applicant has amended claims 2, 12, 16 and 26 to further clarify that the camera recited therein is “operative to acquire images of the particular area of the substrate while the substrate is moving at the speed of at least 200 lineal feet per minute.” Accordingly, withdrawal of the §112 rejection is respectfully requested.

With regard to the rejection of independent claim 1 under §103 as being unpatentable over the proposed combination of O’Boyle and Lofaro, Applicant initially asserts that even if the Examiner could somehow establish that the elements recited in claim 1 were individually known in the art, such arguments are insufficient to establish a *prima facie* case of obviousness. See *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (U.S. 2007) (“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.”) Specifically, the Examiner must provide an explicit “reason to combine the known elements in the fashion claimed by the patent at issue.” *Id.* (Emphasis added)

Here, the Examiner states, as justification for combining the cited references, that “O’Boyle & Lofaro are combinable because they are from the same art of imaging processing and specifically imaging during a CMP of a substrate.” (Office Action; page 5, lines 1-2)

However, simply because two references are in the same field of art does not necessarily render the references combinable for purposes of sustaining an obviousness rejection. For example, as stated in MPEP §2143.01(VI), “[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).” In the present instance, Applicant submits that modification of O’Boyle to accommodate means for determining thin film thickness in situ according to the teachings of Lofaro would significantly change the principle of operation of the apparatus and methods taught by O’Boyle. Consequently, Applicant asserts that the teachings of the references are not sufficient to render the claims *prima facie* obvious.

Even assuming, *arguendo*, that O’Boyle and Lofaro can be combined in the proposed manner, Applicant submits that the collective teaching of O’Boyle and Lofaro fails to disclose each of the limitations recited in claim 1, and therefore a *prima facie* case of obviousness cannot be sustained.

For example, claim 1 recites the steps of “comparing the acquired image to each one of a plurality of stored image patterns” and “converting the acquired image into a layer thickness measurement when the acquired image corresponds to one of said plurality of stored image patterns.” The Examiner contends that O’Boyle, at column 3, lines 23-30, discloses the step of comparing the acquired image to each one of a plurality of stored image patterns. The Examiner further contends that, although O’Boyle does not expressly disclose that the plurality of stored patterns are a plurality of stored image patterns, “it is obvious to one of ordinary skill in the art that the acquired image is compared to reference images.” (Office Action; page 4, lines 10-11) Applicant respectfully disagrees with these contentions.

Contrary to the Examiner’s characterization thereof, O’Boyle fails to disclose comparing an acquired image to any stored reference image patterns, as required by claim 1. Rather, O’Boyle, at column 3, lines 22-29, states:

The sensor control processor 30 also preferably includes a video frame grabber 46 connected to a computer 48. The computer 48 preferably comprises means for comparing a CCD output signal of an imaged wafer 20 with a set of reference characteristics corresponding to known thickness, for providing an output corresponding to a thickness of a thin film structure under a chemical-mechanical planarization process.

O'Boyle fails to provide any teaching or suggestion that the CCD output signal of the imaged wafer is compared to "each one of a plurality of stored image patterns," as explicitly recited in claim 1. Instead, O'Boyle subsequently describes what characteristics are being compared in the disclosed thin film measurement methodology. Specifically, O'Boyle, at column 4, line 59, to column 5, line 4, states:

Pattern recognition on the image obtained from the CCD at a given wavelength allows the wafer orientation in terms of angle and offset to be determined using appropriate mathematics. Once the image position on the wafer is determined, a particular set of measurement sites is selected. The monochromator is then scanned over a range of wavelengths (one wavelength setting per frame), and the pixel values corresponding to the target locations are stored in succession to create an interference spectrum. Using the known values of the optical index of the films, the spectrum at the target region and the instrument response indices function, a value for the desired film thickness is computed using suitable mathematics. (Emphasis added)

In contrast to comparing an acquired image of a particular area of the substrate with each one of a plurality of stored (reference) image patterns, as required by claim 1, O'Boyle discloses a method for determining thin film thickness which involves comparing an interference spectrum created from an output image of the CCD at different wavelengths with known values of the optical index of the films, the spectrum at the target region and the instrument response indices function to thereby mathematically determine thin film thickness. This method taught by O'Boyle, however, is entirely distinguishable from the method recited in claim 1 which utilizes stored image patterns essentially as a look-up table for determining thickness, without performing further mathematical calculation.

Lofaro fails to supplement the above-noted deficiencies of O'Boyle in at least this regard. More particularly, although Lofaro discloses providing real-time measurements for monitoring or endpoint detection purposes during polishing (see, e.g., Lofaro; column 6, lines 64-67; column 7, line 1), Lofaro, like O'Boyle, fails to teach or suggest comparing an acquired image of a particular area of the substrate with each one of a plurality of stored (reference) image patterns for determining thickness, as recited in claim 1.

Furthermore, neither O'Boyle nor Lofaro, when considered either individually or in combination, teaches or suggests the step of "converting the acquired image into a layer

thickness measurement when the acquired image corresponds to one of said plurality of stored image patterns,” as explicitly recited in claim 1. Specifically, nowhere does the collective teaching of O’Boyle and Lofaro disclose comparing an acquired image of the portion of the substrate to stored image patterns, much less determining a layer thickness measurement based on the comparison of the stored image patterns to the acquired image, as expressly required by claim 1.

Independent claims 9, 15 and 23 recite limitations similar to those recited in claim 1 and are therefore believed to be patentable for at least the reasons set forth above in connection with claim 1.

For example, claim 9 is directed to an apparatus for determining layer thickness of a particular area of a substrate during CMP of the substrate which includes “a processing unit in electronic communication with said imager,” the processing unit being operative to “compare the image acquired by said imager to each one of a plurality of image patterns stored in said memory device; and convert the acquired image into a layer thickness measurement when said acquired image corresponds to one of said plurality of image patterns stored in said memory device.” Claim 15 is directed to a method of determining end-point during CMP of a substrate which includes the steps of “comparing the acquired image to stored image patterns” and “converting the acquired image into a layer thickness measurement when the acquired image corresponds to one of the compared stored image patterns.” Claim 23 is directed to an apparatus for determining end-point of an area of a substrate during CMP of the substrate which includes “a processing unit in electronic communication with said imager,” the processing unit being operative to “compare images of the substrate acquired by said imager to image patterns stored in said memory device; convert an acquired image into a layer thickness measurement when said acquired image corresponds to a selected image pattern stored in said memory device.” The collective teaching of O’Boyle and Lofaro fails to disclose or even suggest such methods and/or apparatus.

It is therefore believed that independent claims 1, 9, 15 and 23 are patentable over of the proposed combination of O’Boyle and Lofaro. Accordingly, favorable reconsideration and allowance of claims 1, 9, 15 and 23 are respectfully solicited.

With regard to claims 2-8, which depend from claim 1, claims 10-14, which depend from claim 9, claims 16-22, which depend from claim 15, and claims 24-28, which depend

from claim 23, Applicant asserts that these claims are also allowable by virtue of their dependency from their respective base claims, which are believed to be patentable for at least the reasons identified above. Moreover, one or more of these claims is believed to define patentable subject matter in their own right. Accordingly, favorable reconsideration and allowance of claims 2-8, 10-14, 16-22 and 24-28 are respectfully requested.

In view of the foregoing, claims 1-28 are believed to be in condition for allowance, and such favorable action thereon is respectfully solicited.

Respectfully submitted,



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